PENTAIR

Raychem NGC-30

INSTALLATION MANUAL

Firmware version # - V1.18

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SECTION 1 – OVERVIEW

1.1 INTRODUCTION

The Raychem NGC-30 is a fully wired and tested control and monitoring system used with electric heat tracing. This manual provides information pertaining to the installation, operations, testing, adjustment, and maintenance of all components of the Raychem NGC-30. For information about how to program the Raychem NGC-30, see the Raychem NGC-30 Programming Guide (H58186)

A typical Raychem NGC-30 is made up of at least a User Interface Terminal (NGC-UIT), one Card Rack (NGC-30-CR), one Card Rack Module with connectors (NGC-30-CRM or NGC-30-CRMS), and one Current Transformer Module (NGC-30-CTM). Optional Remote Monitoring Module (RMM2), Power Line Carrier Interface (PLI) and Voltage Monitoring Module (NGC-30-CVM) may be used.

The information in this document coincides with the specific releases of firmware (listed in Table 1.1.) for the User Interface Terminal (NGC-UIT) and Card Rack Module (NGC-30-CRM/-CRMS) components. As Pentair Industrial Heat Tracing Solutions releases new firmware to significantly modify or enhance any of these components, new documentation will accompany these releases. To ensure that the correct documentation is being used for your particular version of the Raychem User Interface Terminal (NGC-UIT), compare the firmware version number of each component against the number listed in the table below. As subsequent changes are made, supplements to this document will be included in manuals shipped after the firmware is released. Supplements will make specific reference to the operation or functional change.

Copies of this manual and updates may be downloaded from the Literature section of www.pentairthermal.com

Table 1.1	**Component versions**
Component	**Version number**
NGC-CRM/CRMS	V1.0X
NGC-UIT	V1.1X
RMM2	V1.0X

SECTION 2 – INSTALLATION AND WIRING

2.1 INTRODUCTION

⚠ WARNING:

Electrical Hazard! Ensure all personnel involved in installation, servicing, and programming are qualified and familiar with electrical equipment, their ratings, and proper practices and codes. Multiple voltages and signal levels may be present during the installation, operation, and servicing of this product. Do not power the product until the safety provisions outlined in this section have been observed.

This section includes information regarding the initial inspection, preparation for use, and wiring instructions for the components of the Raychem NGC-30.

2.2 INITIAL INSPECTION

Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, it should be kept until the contents of the shipment have been verified for completeness and the equipment has been checked mechanically and electrically. Procedures for installing the Raychem NGC-30 are given in this section. If the shipment is incomplete, mechanically damaged, defective in any way, or does not pass the electrical performance tests, notify the nearest Pentair Industrial Heat Tracing Solutions representative. If the shipping container is damaged, or the cushioning material shows signs of stress, notify the carrier as well as your Pentair Industrial Heat Tracing Solutions representative. Keep the shipping materials for the carrier's inspection.

2.3 OPERATING ENVIRONMENT

There are three types of User Interface Terminals (UITs) available with the Raychem NGC-30 panel, as shown in Table 2.1. The term "NGC-UIT" in this document refers to any of the available NGC-UITs, regardless of which model is actually installed.

Table 2.1 NGC-30 User Interface Terminals (UITs)

UIT type	Area classification	Usage
NGC-UIT-ORD	Nonhazardous (Unclassified) Locations	NEMA 12 • (Indoors)
NGC-UIT-ORD-12	Nonhazardous (Unclassified) Locations • The NGC-UIT-ORD-12 must be installed in an nonhazardous, indoor location. • The NGC-UIT-ORD-12 connects to NGC-30 panels using RS-485 communication wiring.	NEMA 12 • (Indoors)
NGC-UIT-OUT	Hazardous Locations* • Designed for mounting on the Raychem NGC-30 external panel door. • Class I, Division 2, Groups A, B, C, D • Class I, Zone 2, Group IIC • Temperature Class T4 Outdoor Locations **Hazardous locations are defined by Article 500 of the National Electrical Code and/or Part 1, Section 18 of the Canadian Electrical Code.*	NEMA 4 or 4X • (Outdoors, solid-state re-lays) NEMA 4X-P • (Outdoors, mechanical relays with Z purge option)

⚠ WARNING:

Some wiring configurations will use more than one power source. All power sources must be de-energized prior to performing any maintenance on a card rack module or its heating circuit. The operating environment should be within the limitations specified for the Raychem NGC-30 components as outlined in Appendices B, C, and D.

2.4 INSTALLATION LOCATION

The wide Operating Temperature of the Raychem NGC-30 permits installation in almost any convenient location. Considerations should include: expected atmospheric conditions (weather), accessibility for maintenance and testing, the location of existing conduits, and hazardous location rating. Ambient temperature conditions may affect load current ratings.

⚠ CAUTION:

Always be sure that the intended location is classified as an area that the product is approved for use in as defined by Article 500 of the National Electrical Code and/or Part I, Section 18 of the Canadian Electrical Code.

2.5 MOUNTING PROCEDURES

Each Raychem NGC-30 panel includes a set of "As Built" drawings that have been engineered, designed, and drafted based upon the model number and any special requirements that were requested when ordering. The "As Built" drawings include an elevation/layout (with bill of materials) and schematics. If these drawings are not included, contact your Pentair Industrial Heat Tracing Solutions Representative and request the "As Built" drawings for your panel. Upon request, an electronic copy of these drawings can be provided.

For mounting the panel, locate the elevation and layout drawing which includes a bill of materials. The enclosure mounting information will be provided on the "As Built" drawings.

2.6 WIRING PROCEDURES

Refer to the "As Built" drawings for wiring of incoming/outgoing power and incoming RTD connections. The Raychem NGC-30 panel can be purchased with, or without, a distribution panel board.

2.6.1 INCOMING POWER WITH DISTRIBUTION SYSTEM

Main Circuit Breaker

Locate the main circuit breaker in the panel by using the supplied elevation/layout drawing, and connect per the associated schematic drawings. Depending upon the size and type of main circuit breaker and voltage loss calculations, use the appropriate size and number of wires to connect directly to the main circuit breaker, and panel board neutral and ground bus in the panel.

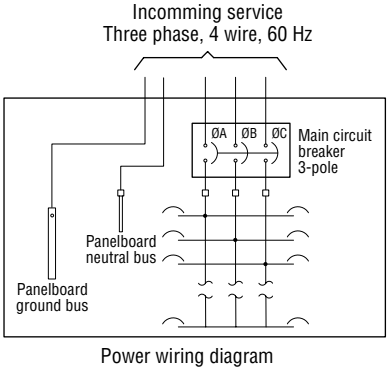


Fig. 2.1 Main circuit breaker wiring

Branch Circuit Breakers

The branch circuit breakers are pre-wired to the contactors or solid-state relays in the panel, so no further incoming power wiring is required.

2.6.2 OUTGOING POWER WITH DISTRIBUTION SYSTEM

Load Power Terminal Blocks

Locate the outgoing heater terminal blocks using the supplied elevation/layout drawing, and connect per the associated schematic drawings. Depending upon the size of the branch circuit breaker and voltage loss calculations, use the appropriate size and number of wires to connect from the panel's Load Power Terminal Blocks to the heat-trace power junction box.

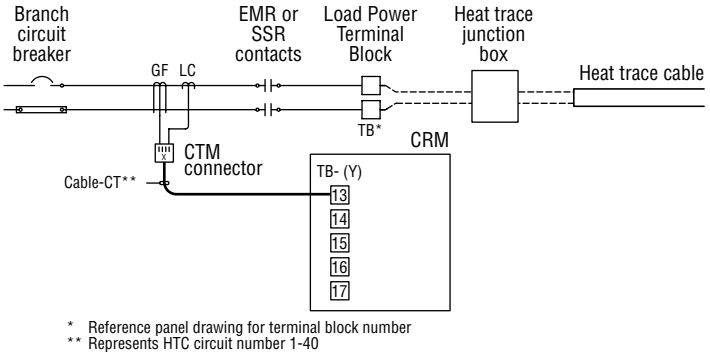


Fig. 2.2 Heat trace power wiring diagram

2.6.3 INCOMING/OUTGOING POWER WITHOUT DISTRIBUTION PANEL BOARD

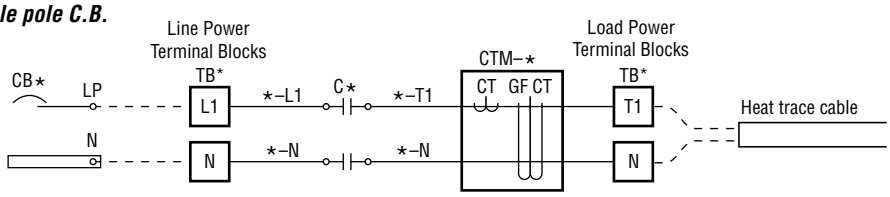
Line Power Terminal Blocks

Locate the incoming power terminal blocks in the panel using the supplied elevation/layout drawings and connect per the associated schematic drawing. Depending upon size and type of the remotely located branch circuit breakers, use the appropriate size and number of wires to connect directly to the Line Power Terminal Blocks.

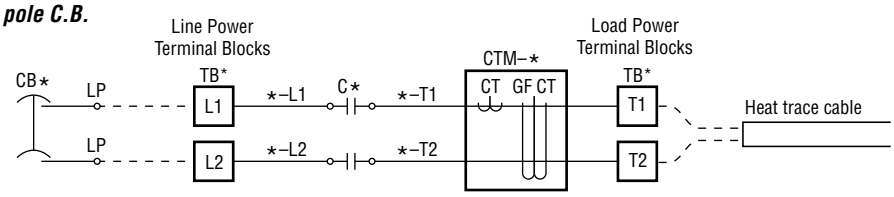
Load Power Terminal Blocks

Locate the outgoing power terminal blocks in the panel using the supplied elevation/layout drawings and connect per the associated schematic drawing. Depending upon size and type of the remotely located branch circuit breakers, use the appropriate size and number of wires to connect from the Load Power Terminal Blocks to the heater's power connection box.

Single pole C.B.



Two pole C.B.



* Reference panel drawing for terminal block number

Fig. 2.3 Single pole and two pole circuit breaker wiring diagrams

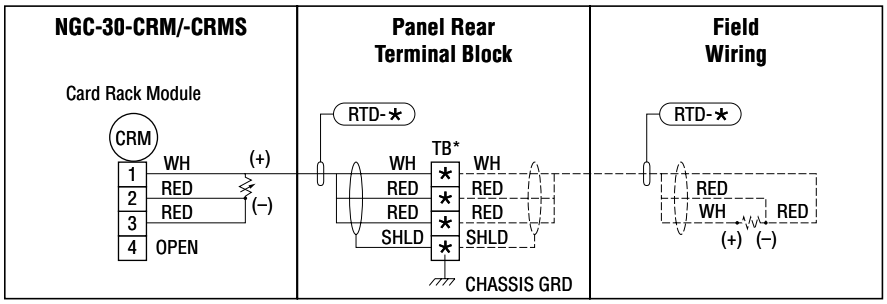
2.6.4 INCOMING RTD WIRING

Nonhazardous and Hazardous Location Installations Wired to Terminal Block in Panel

The RTD wiring from the NGC-30-CRM/-CRMS have been pre-wired to RTD terminals. The field RTD wiring (3-wire with shield) will be terminated by the installer at the RTD terminal blocks. Refer to the Installation Drawings for the RTD Termination Schedule.

See Fig. 2.4 on page 8 for a typical RTD installation.

Note: To meet the requirements for hazardous location installations, a separate RTD terminal block must be installed and wired to the NGC-30-CRM/-CRMS RTD terminal connector.



* Reference panel drawing for terminal block number

Fig. 2.4 Typical RTD installation

2.6.5 CONNECTING THE RS-485 DEVICE NETWORK

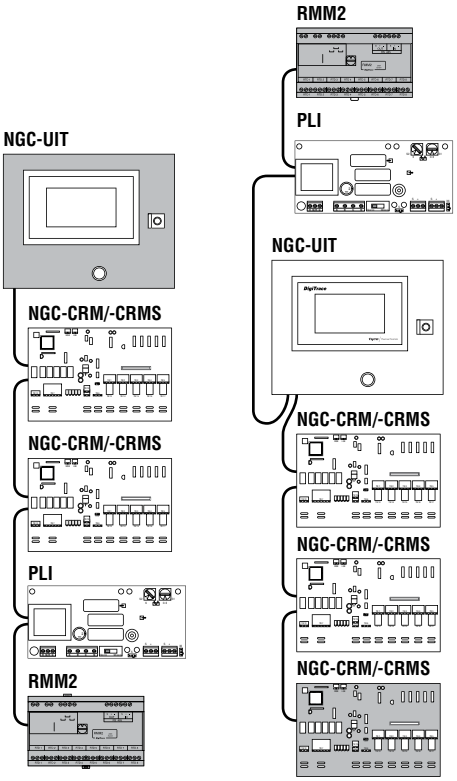
The NGC-UIT display is typically linked to a network of Raychem NGC-30-CRMs/-CRMSs and optional RMM2s and PLIs. These are connected to the Raychem NGC-UIT using an RS-485 communication cable (shielded, two conductor, twisted pair). The following illustration shows how the RS-485 network for the NGC-UIT system may be configured.

Device must be mounted in series.

(Terminated devices are shown in gray)

Branching of the network is not allowed.

Connect no more than two RS-485 cables to any device.



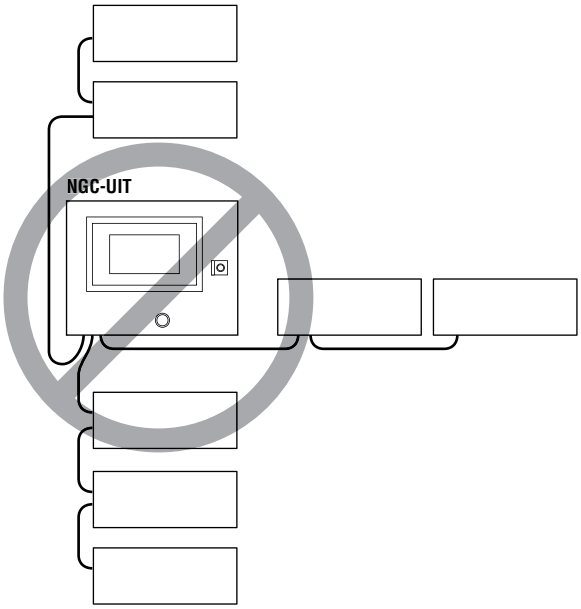


Fig. 2.5 RS-485 network configuration for the NGC-UIT system

In order for the RS-485 network to work properly, you must enable the termination resistor for the first and last device. The devices shown in gray in Fig. 2.5 represent the devices for which you must enable the termination resistors. The devices that are not grayed out represent the devices for which you should not enable the termination resistors.

Optional RMM2 Installed in the Field

Refer to the RMM2 Installation Instructions (H56848) for field installation instructions. You must connect a RS-485 connection from the RMM2 to an open RS-485 connector on the NGC-30-CRM/-CRMS board in the Raychem NGC-30 panel. To make this connection, a pre-wired terminal block has been provided in the Raychem NGC-30 panel. Connect the RS-485 wire from the RMM2 to TB (per the panel drawing) while maintaining the correct polarity. If the RMM2 is the first or last device in the RS-485 network, connect the J17 termination jumper to pins 1 and 2. If the RMM2 is not the first or last device in the RS-485 network, connect the J17 termination jumper to pins 2 and 3.

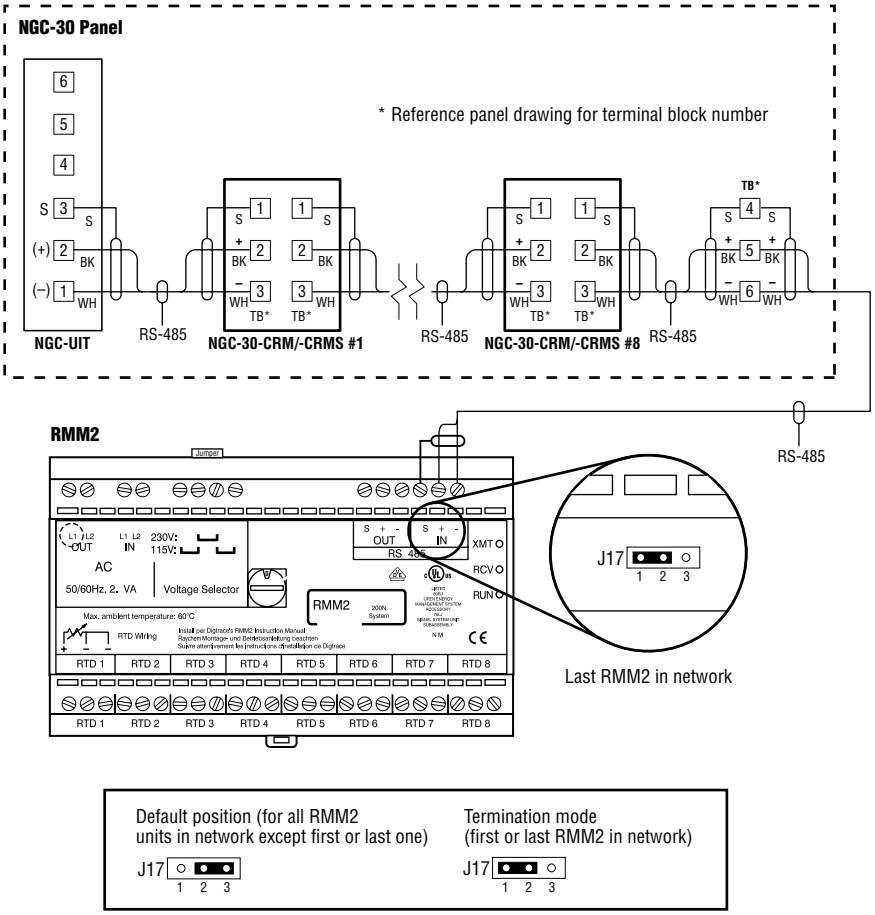


Fig. 2.6 RMM2 RS-485 field wiring and termination jumper setting

Optional PLI Installed in the Panel

Refer to the PLI Installation Instructions (H56850). You must connect a RS-485 connection from the PLI to an open RS-485 connector on the NGC-30-CRM/-CRMS board in the Raychem NGC-30 panel. IF the PLI is the first or last device in the RS-485 network, remove the shorting block jumper location J2 from 1 and 2 and place it across pins 2 and 3.

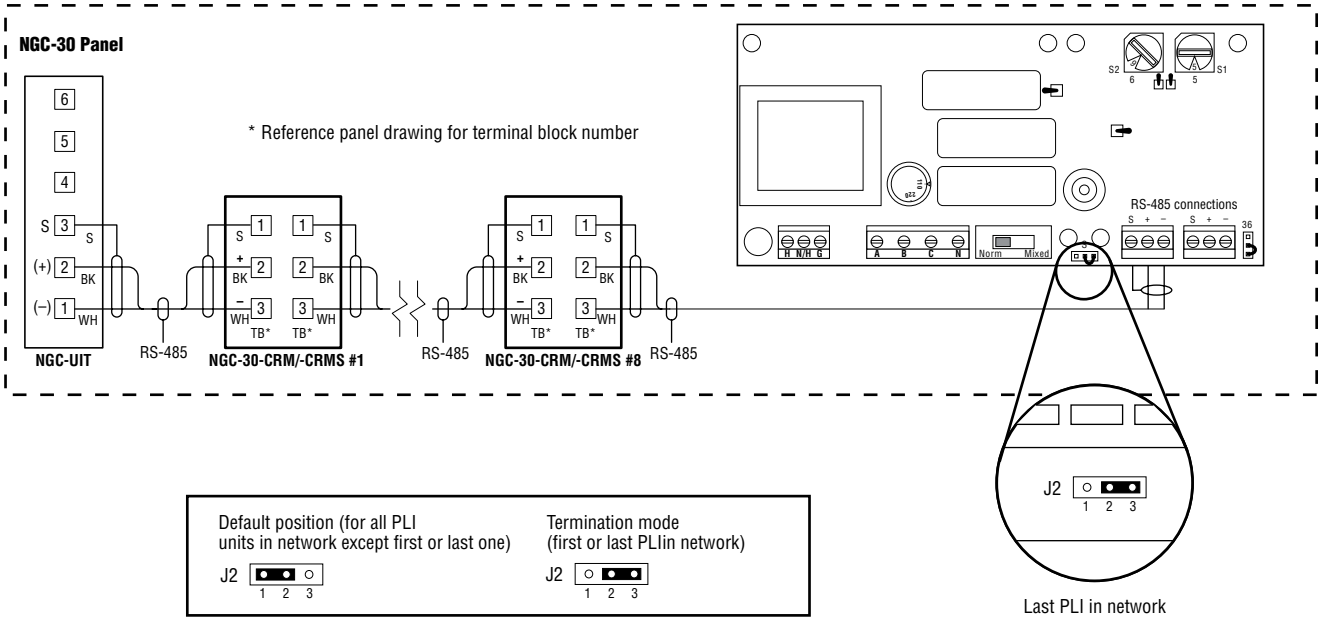


Fig. 2.7 PLI RS-485 panel wiring and termination jumper setting

NGC-UIT Installation

The NGC-IUT-ORD and NGC-UIT-OUT will come pre-wired into any NGC-30 panel. Exceptions exist when a remote mount NGC-UIT (NGC-UIT-ORD-12) is used or the NGC-30 panel is wired to the NGC-UIT in another panel. Fig. 2.8 shows the wiring for the NGC-30-ORD-12 and Fig. 2.10 shows the wiring between a separate panel and the NGC-UIT.

NGC-UIT-ORD-12 Installation

You must make an RS-485 connection from the NGC-UIT-ORD-12 to the NGC-30-CRM/-CRMS board in the NGC-30 panel. To make this connection, a pre-wired terminal block has been provided in the NGC-UIT-ORD-12 and in the NGC-30 panel. Connect the RS-485 wire from TB3 in the NGC-UIT-ORD-12 and the other end to TB* in the NGC-30 panel maintaining the correct polarity. If the NGC-UIT-ORD-12 and/or the NGC-30-CRM/-CRMS is the first or last device in the RS-485 network, see Fig. 2.9 and Table 3.2 for details on how to terminate the RS-485 network.

* Reference panel drawing for terminal block numbers.

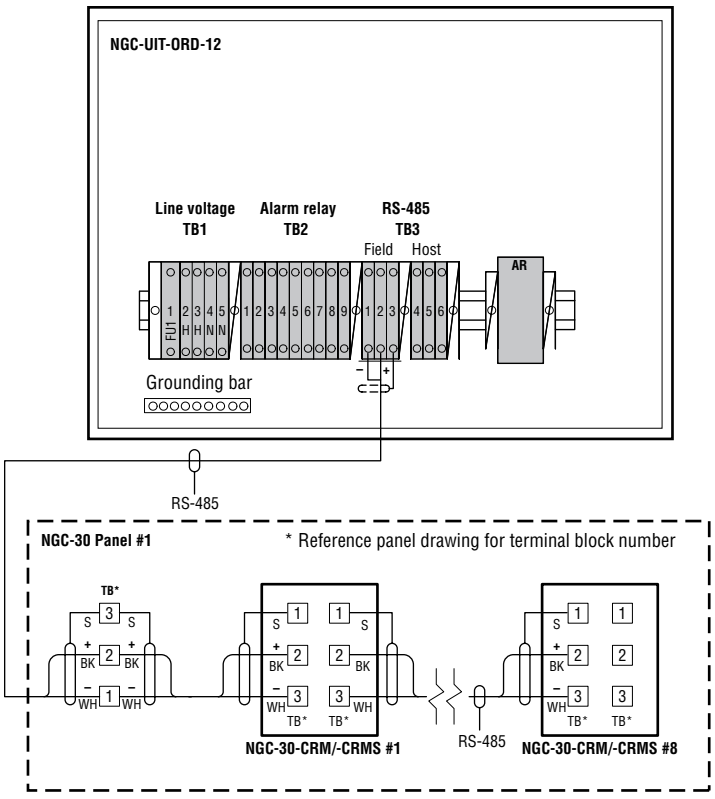


Fig. 2.8 NGC-UIT RS-485 field wiring

The following figure shows the RS-485 termination options for the NGC-30-CRM/-CRMS.

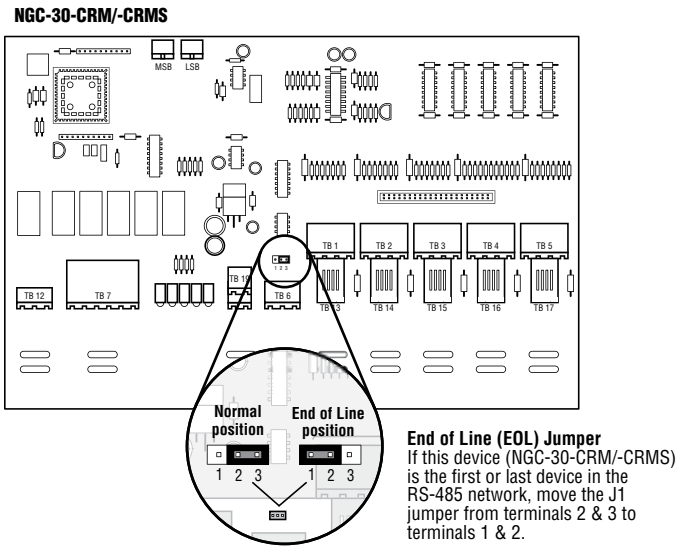


Fig. 2.9 Termination of RS-485 network for NGC-30-CRM/-CRMS

NGC-30 Panel with NGC-UIT Connected to an NGC-30 Panel without NGC-UIT

This wiring is used when a single UIT in one panel is the central point for multiple NGC-30 panels. Because the NGC-UIT can handle up to 260 heat tracing circuits, it can be cost effective to use one NGC-UIT for multiple panels. An RS-485 connection must be made from the panel that has the NGC-UIT (panel #1) installed to the NGC-30-CRM/-CRMS board in NGC-30 (panel #2) that does not have the NGC-UIT installed (see Fig. 2.10). To make this connection, a pre-wired terminal block has been provided in the panel #1 and in panel #2. Connect the RS-485 wire from TB* in panel #1 and the other end to TB* in panel #2 maintaining the correct polarity.

If the NGC-30-CRM/-CRMS is the first or last device in the RS-485 network, see Fig. 2.9 and Table 3.2 for details on how to terminate the RS-485 network.

* Reference panel drawing for terminal block numbers.

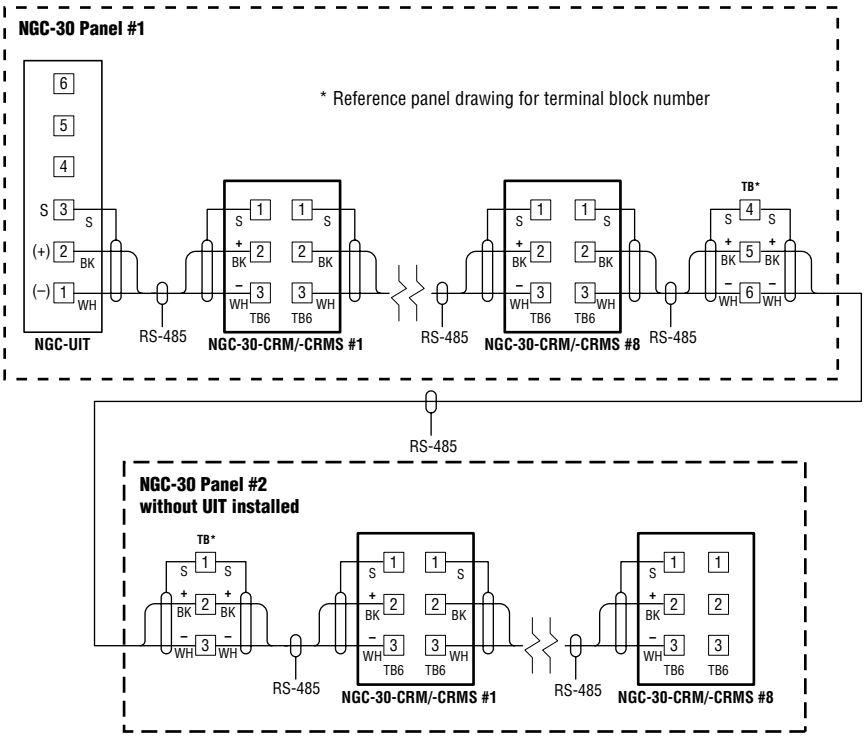


Fig. 2.10 RS-485 field wiring between two Raychem NGC-30 panels

2.7 CONNECTIONS FOR REMOTE ANNUNCIATION

Relay 1 on the NGC-UIT has been factory-configured and wired for "Any Alarms" unless otherwise specified. It is powered by 120 Vac and will energize a light on the front of the panel if any alarm occurs. Relay 1 was also wired to a common alarm relay/terminal block for remote annunciation of any alarms. Please see below the NGC-UIT Relay 1 in non-energized, energized and in alarm condition.

NGC-UIT Relay 1

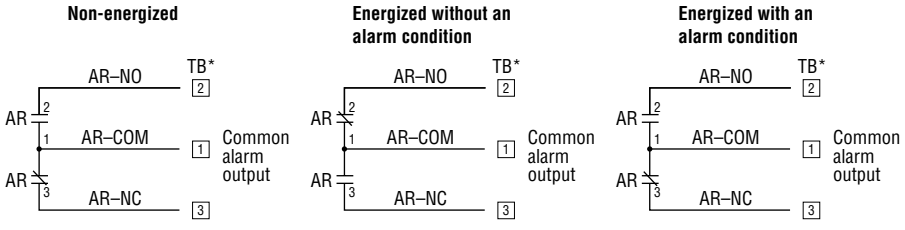
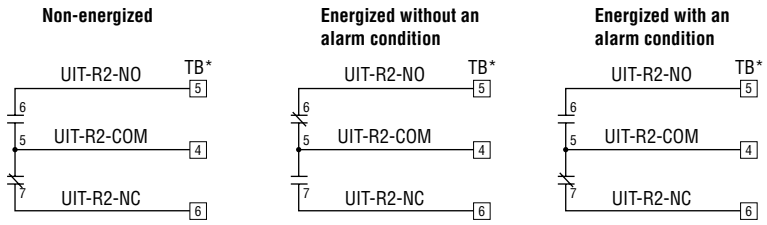


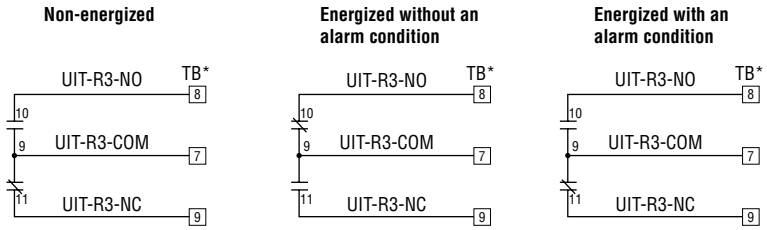
Fig. 2.11 Relay 1 wiring

The NGC-UIT has two other Form C alarm relays (configurable through the NGC-UIT program) for external alarms. Each relay can be connected to an annunciator light or distributed control system. Each relay's contacts have been wired from the NGC-UIT to a terminal block in the panel.

NGC-UIT Relay 2



NGC-UIT Relay 3



* Reference panel drawing for terminal block number

Fig. 2.12 Relays 2 and 3 wiring

Note: An energized relay with no alarm condition will change state with loss of power or an alarm condition.

2.8 RS-232, RS-485, OR ETHERNET REMOTE PORT CONNECTIONS TO A HOST COMPUTER

The NGC-UIT can communicate with a distributed control system (DCS) or other host computer through the NGC-UIT external communication ports. The NGC-UIT provides ports for RS-232, RS-485, and Ethernet communication. All of these communication ports provide data read access. However, only one port can be assigned read/write access. This is done using the NGC-UIT.

2.8.1 RS-232 SERIAL CONNECTIONS

The RS-232 port can be used as a direct connection to a single PC located within 50 feet of the panel. (Refer to Fig. 2.13 on page 15). For an RS-232 connection, a 3-foot long RJ11 to 9-pin female D-connector (NGC-UIT-232, part number: 10332-005) has been provided with the NGC-UIT. Plug the RJ11 connector into the RS-232 connector on the NGC-UIT and the other end into the 9-pin male connector on the user's computer.

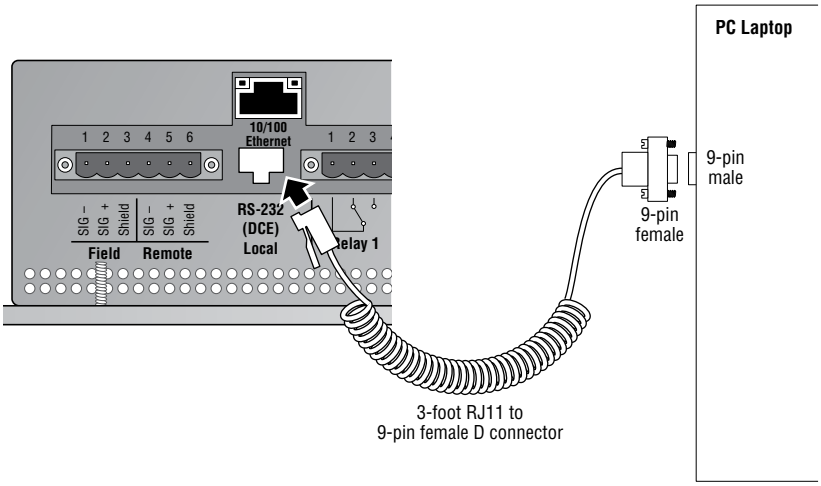


Fig. 2.13 RS-232 connection

2.8.2 RS-485 SERIAL CONNECTIONS

Use the RS-485 port when multiple NGC-UIT units are to be connected to a host computer or the connection is longer than 50 feet. An RS-485 to RS-232 or RS-485 to USB converter may be required to make the connection to the user's PC.

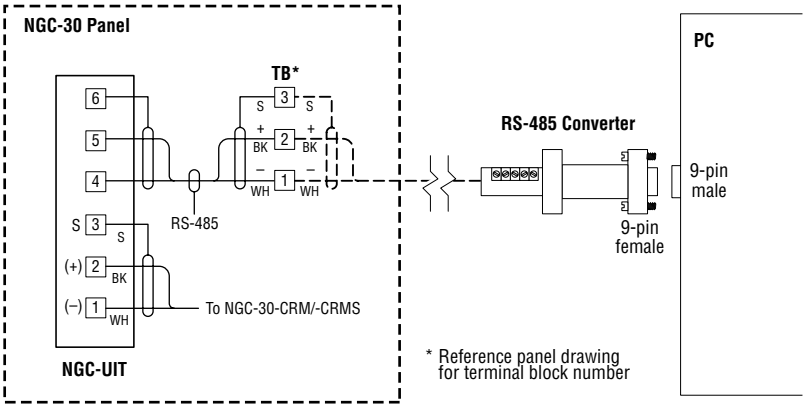


Fig. 2.14 RS-485 connection

2.8.3 ETHERNET CONNECTIONS

The Ethernet port can be used to connect multiple NGC-UIT units to a host computer by connecting to the user's LAN system.

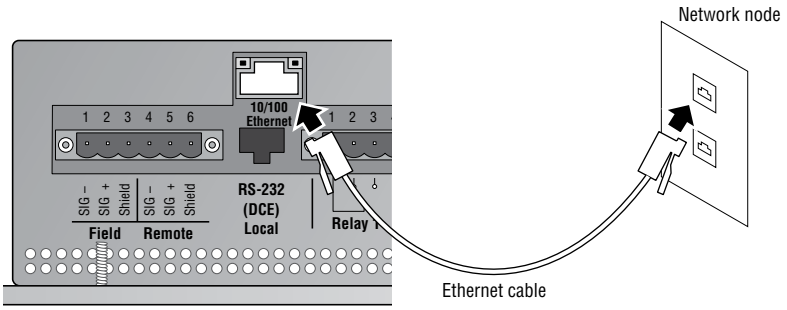


Fig. 2.15 Ethernet connection

2.9 TESTING THE NGC-30 SYSTEM

Once the wiring to the panel has been finished, confirm that it was done properly by completing the following steps:

1. Turn the power on to all network devices (NGC-30-CRMs/-CRMSs and optional RMM2s & PLI modules) and the NGC-UIT.
2. Once the NGC-UIT has booted up to the Main screen, Go to the Network | Device Screen and press "Update Network."

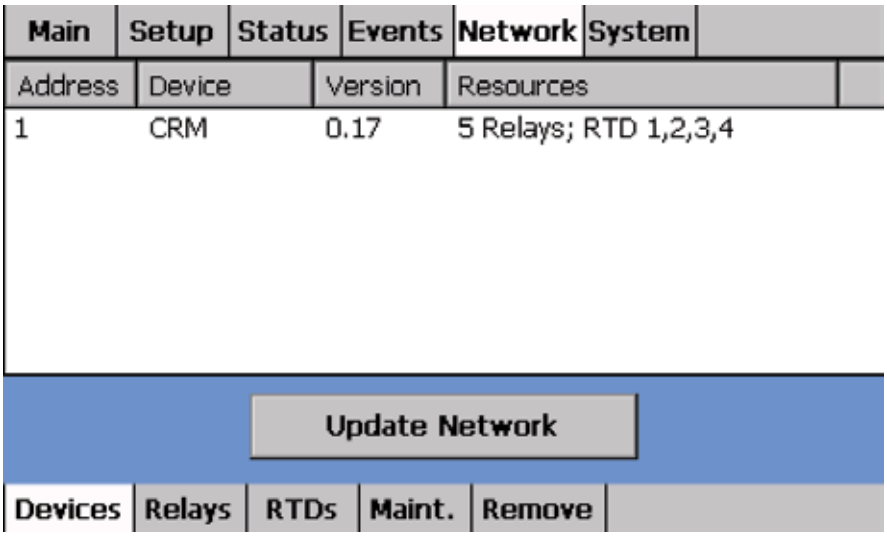


Fig. 2.16 Network|Devices screen

3. Confirm all NGC-30-CRM/-CRMS, RTDs and/or RMM2s and PLI modules have been scanned into the Network database.
4. If a device or an RTD is installed but does not show up in the Network | Devices Screen, turn the power off to the system and:

For Devices:

a. Confirm the device has a unique address (refer to section 3.2 on page 21)
b. Confirm the device is being powered
c. Confirm the RS-485 connection is in place with the correct polarity (refer to section 2.6.5)

For RTDs:

a. Confirm the RTD connection is in place with the correct polarity
b. Perform a resistance check of the RTD. The resistance should be in a range of 70–250 ohms

Turn the power on to all devices (NGC-30-CRMs/-CRMSs and optional RMM2s & PLI) and the NGC-UIT. Once the NGC-UIT has booted up to the Main screen, Go to the Network | Device Screen and press "Update Network." Confirm all NGC-30-CRM s/-CRMSs, RTDs, and/or RMM2s and PLI modules have been scanned into the Network database.

SECTION 3 – RAYCHEM NGC-30 COMPONENTS AND OPERATION

The Raychem NGC-30 heat-trace system is comprised of a number of modular components, allowing the ultimate in design flexibility. This section describes the NGC-30 control and monitoring components (excluding the optional distribution section). Appendix B, C, and D includes the specifications for these components.

3.1 USER INTERFACE TERMINAL (NGC-UIT)

The NGC-UIT is a panel mounted color LCD display with touch-screen overlay. The NGC-UIT includes software that interfaces with the Card Rack Modules (NGC-30-CRM and NGC-30-CRMS) and the Remote Monitoring Module (RMM2) and Power Line Carrier Interface (PLI) module. The NGC-UIT is used as a control panel, setup device and user display.

3.1.1 MULTIPLE NGC-UIT MODELS

There are three versions of User Interface Terminals (UITs) available as specified in Table 2.1, "NGC-30 User Interface Terminals (UITs)," on page 5. All versions use the same wiring, system interface, and programming. The NGC-UITs differ only in the environments in which they can be installed. The term "NGC-UIT" in this document refers to any of the available NGC-UITs, regardless of which model is actually installed.

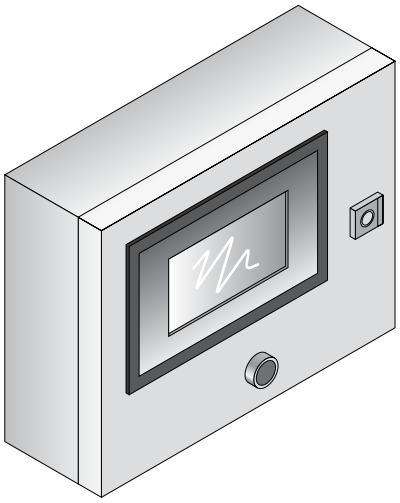


Fig. 3.1 Typical NGC-UIT model showing NGC-UIT-ORD-12 remote user interface terminal

The physical dimensions of each NGC-UIT model vary; the dimensions of the NGC-UIT-ORD-12 shown in the figure are the largest of all NGC-UITs:

- Width: 15" (381 mm)
- Height: 11.8" (300 mm)
- Depth: 6.1" (155 mm)

NGC-UIT LCD Touch-Screen Display

Each NGC-UIT has a 5 ¾ inch x 3 ¼ inch (14.61 cm X 8.26 cm) LCD color display with touch-screen technology that provides an user interface easy and efficient programming with no keyboards or cryptic labels.

3.1.2 NGC-UIT LOCAL AND REMOTE NETWORK CONNECTIONS

The NGC-UIT communicates to both a local field network and optionally to a remote monitoring and control network.

Local Field Network Connection

The local field network always uses an RS-485 serial connection running over shielded twisted-pair cable. This network is used to connect the NGC-UIT to its control and monitoring modules:

- Raychem Mechanical Contactors Controller - NGC-30-CRM
- Raychem Solid State Relay Controller - NGC-30-CRMS
- Raychem Current Transformer Module Controller - NGC-30-CTM
- Raychem Voltage Monitoring Module - NGC-30-CVM
- Raychem Remote Monitoring Module - RMM2
- Raychem Power Line Carrier Interface Module - PLI

The local field network must follow configuration rules about topology and termination of network end devices.

Remote Monitoring and Control Network Connection

The remote monitoring and control network communicates via a selectable network connection port using either RS-485, RS-232, or 10/100Base-T Ethernet. This network is used to connect to multiple NGC-UIT systems and communicate with a central PC running Raychem Supervisor software. The Raychem Supervisor software provides centralized status and alarm monitoring, data logging, and remote configuration control over all attached NGC-UIT systems in the network. The remote monitoring and control network must also follow configuration rules about topology and termination of the network end devices.

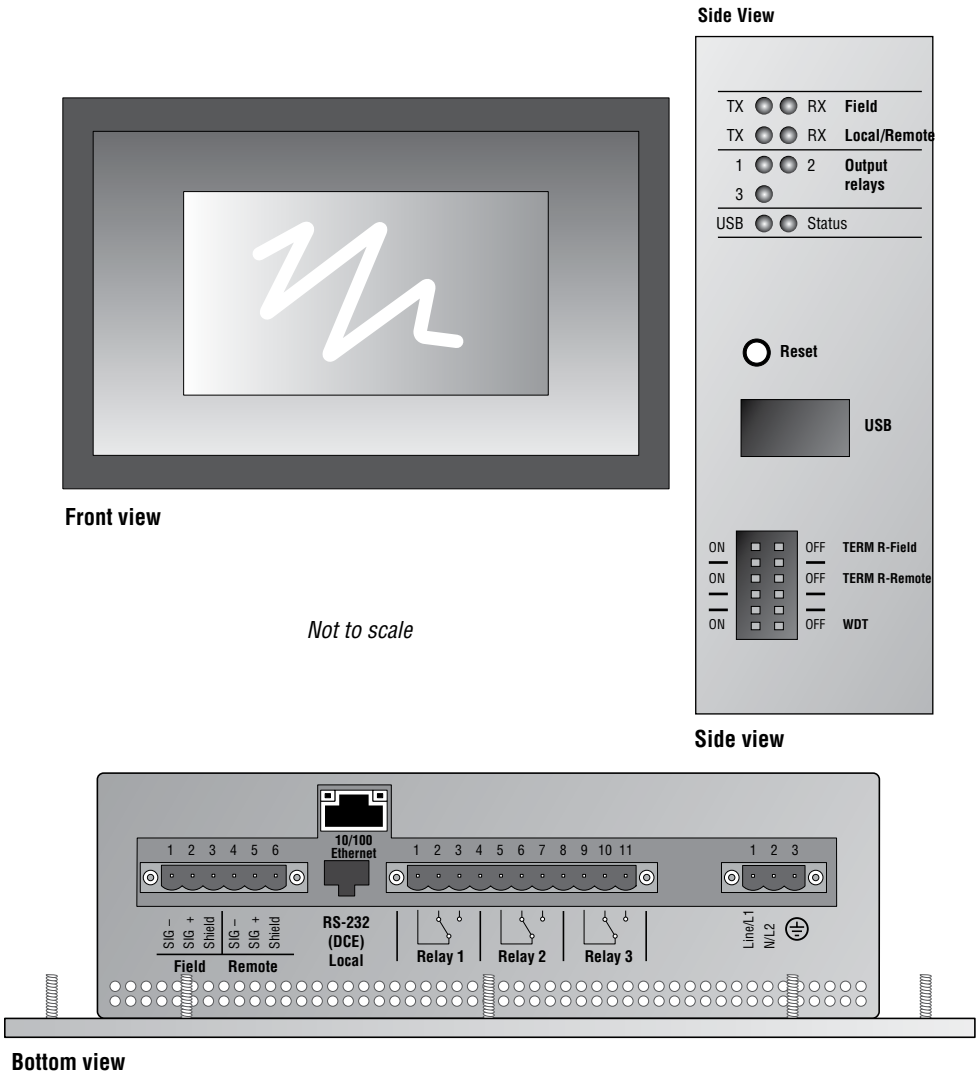
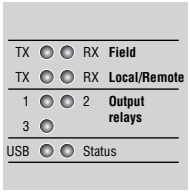


Fig. 3.1 NGC-UIT touch-screen display, controls, and connections

3.1.3 NGC-UIT LED STATUS

The LED Status lights are located on the side of the NGC-UIT. Refer to Table 3.1for LED functions.

Table 3.1 LED Status Light Functions



LED functions

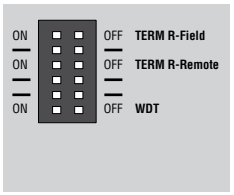
State	Status	USB	Field		Local/Remote		Relays
			RX	TX	RX	TX	
OFF	No power	No USB key detected	No activity	No activity	No activity	No activity	Relay in NO position
Green	Normal operation*	USB key inserted*	Flicker on receipt of data packet	Flicker on transmission of data packet	Flicker on receipt of data packet	Flicker on transmission of data packet	Relay energized contacts in NC position
Yellow	UIT loading	USB in use*					

* State controlled by software, all other states controlled by hardware.

3.1.4 CONFIGURATION SWITCHES

The configuration switches are also located on the side of the NGC-UIT. The TERM R-FIELD setting refers to the local RS-485 network that connects the NGC-UIT to attached -CRM, -CRMS, and/or RMM2 devices. The TERM R-REMOTE SETTING refers to connections between the NGC-UIT and a central PC running Raychem Supervisor software. Refer to Table 3.2 for LED functions.

Table 3.2 Configuration Switch Functions



Configuration Switches

Switch	Position		Comments
	On	Off	
TERM R-FIELD (Field Port Termination Select) *Terminates local RS-485 network.*	120 Ohm Termination Enabled (Factory Default)	Termination Disabled	For the local FIELD RS-485 network. If this NGC-UIT is the first or last RS-485 device in the network, it must be set to ENABLED/ON. If the NGC-UIT is *NOT* the first or last device, it must be set to DISABLED/OFF.
TERM R-REMOTE (Remote Port Termination Select) *Terminates remote RS-485 network connected to PC and Raychem Supervisor software.*	120 Ohm Termination Enabled	Termination Disabled (Factory Default)	For the REMOTE RS-485 network connected to a PC. If this NGC-UIT is the first or last RS-485 device in the remote network, it must be set to ENABLED/ON. If the NGC-UIT is NOT the first or last device, it must be set to DISABLED/OFF.
WDT (Watch Dog Timer)	WDT Enabled (Factory Default)	WDT Disabled	WDT should normally be enabled

3.1.5 NGC-UIT RESET SWITCH

The reset switch is located on the side of the NGC-UIT panel. A pointed object is required to press the restart switch and restart the UIT software.

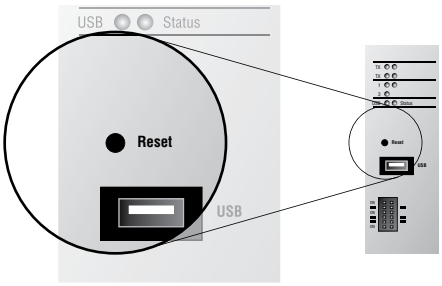


Fig. 3.2 Reset switch

3.2 CARD RACK MODULE (NGC-30-CRM/-CRMS) AND CURRENT TRANSFORMER MODULE (NGC-30-CTM)

Each Card Rack Module (NGC-30-CRM and NGC-30-CRMS) and Current Transformer Module (NGC-30-CTM) provide ground-fault and line current sensing, alarming, switching, and RTD input for five Loops. The NGC-30-CRM is used with electromechanical relays. The NGC-30-CRMS is used with solid-state relays. The NGC-30-CRM/-CRMS may be connected to one User Interface Terminal (NGC-UIT).

Each NGC-30-CRM/-CRMS must have a unique communication address. The valid address switch range for the NGC-UIT is 1–99. SW1 is the ones digit (0–9) and SW2 is the tens digit

(0–9). See Fig. 3.3.

Note: RMM2s use ModBus addresses 32 through 47 and PLIs use Modbus addresses 1-99. When using RMM2s and PLI modules in an NGC-30 system, care must be taken to not assign the same addresses to an RMM2, PLI module or an NGC-30-CRM/-CRMS board.

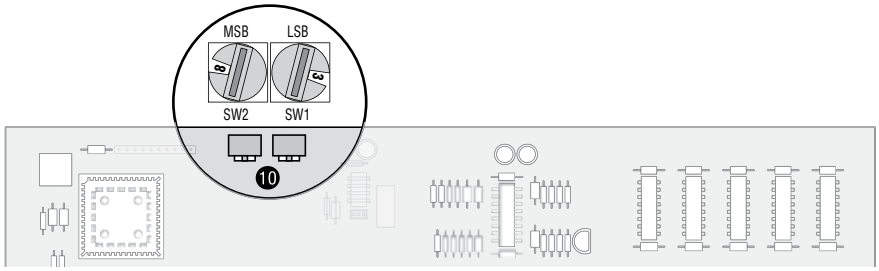
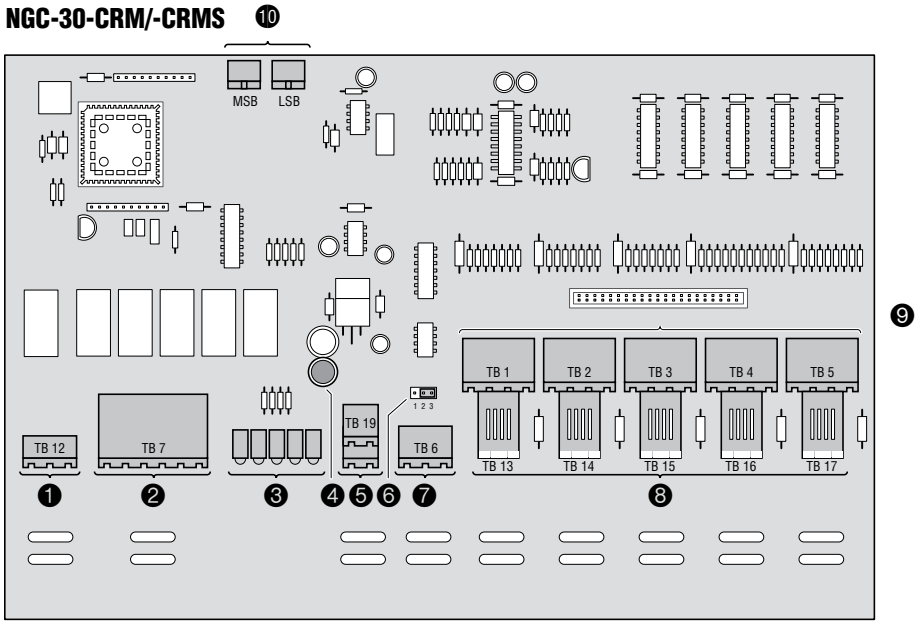


Fig. 3.3 Communication address switch

Note: When adding an NGC-30-CRM/-CRMS to the system, power must be cycled to the board and a network update on the NGC-UIT must be performed.

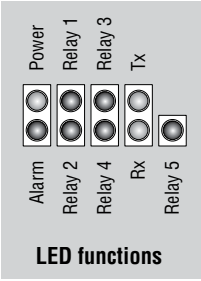


1. Alarm output
2. Relay outputs (5x)
3. LEDs (9x)
4. Fuse
5. 12 Vdc Inputs (2x)
6. End of Line (EOL) jumper
7. RS-485 Communications
8. Line & ground-fault sensor inputs (5x)
9. RTD Inputs
10. Address Switches

Fig. 3.4 NGC-30-CRM/-CRMS Board l Layout

Each NGC-30-CRM/-CRMS has a cluster of nine LED lights to advise the status of the board. Number 3 in Fig. 3.4 shows the location of the LED lights.

Table 3.3 LED Display



LED function	LED description	LED color
Alarm	Energized upon Alarm	Red
Power	Energizes upon power to unit	Green
Relays 1, 2, 3, 4, 5	Energizes upon relay closed	Red
RX & TX	Energizes upon received and transmit of RS-485 data	Amber

3.3 CARD RACK (NGC-30-CR)

The Card Rack (NGC-30-CR) has the capability to house one to four Card Rack Modules (CRMs).

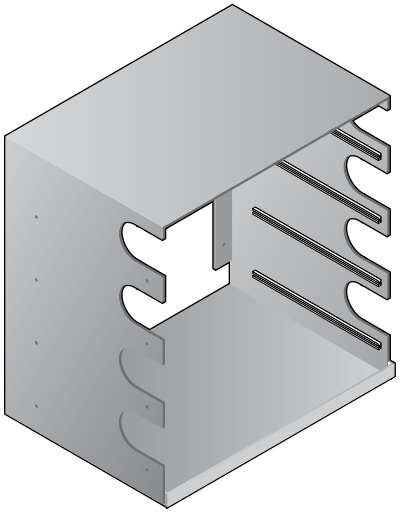


Fig. 3.5 NGC-30 card rack

3.4 VOLTAGE MONITORING MODULE (NGC-30-CVM) – OPTIONAL

The optional voltage sensor can monitor 80–290 Vac. This voltage sensor connects to one of the five line current/ground-fault inputs of the NGC-30-CRM/-CRMS (Note: By using the optional voltage sensors, the NGC-30-CRM/-CRMS board looses one circuit).

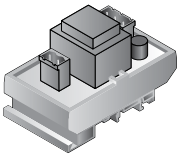


Fig. 3.6 NGC-30 voltage monitoring module

3.5 REMOTE MONITORING MODULE (RMM2) – OPTIONAL

The Raychem Remote Monitoring Module (RMM2) provides additional temperature monitoring capabilities. Each RMM2 accepts up to eight RTDs that measure pipe, vessel, or ambient temperatures. The RMM2 can be installed in the Raychem NGC-30 enclosure or can be located in the field to reduce RTD field wiring.The Raychem NGC-30 system supports 260 temperature inputs via the CRM/CRMs boards. Sixteen (16) RMM2s can be connected via a single, twisted pair RS-485 cable to provide up to 128 additional RTD inputs into the Raychem NGC-30 system.

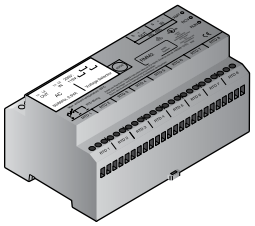


Fig. 3.7 RMM2 module

Set the RS-485 address for the RMM2 using the rotary switch provided. Note the orientation of the clear plastic cover, then remove the cover. Use a slotted screwdriver to rotate the selector switches to the appropriate positions to select the RS-485 address. The single character visible on the switch indicates the RS-485 address assigned.

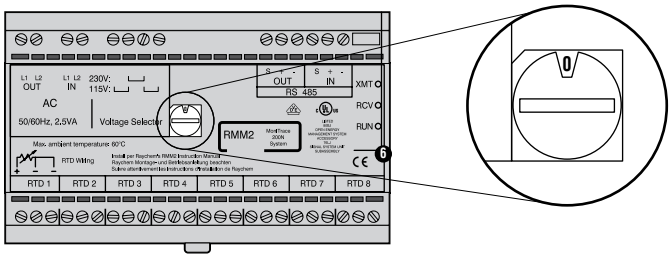


Fig. 3.8 RMM2 rotary switch

Table 3.4 RMM2 Switch Settings

Switch Settings	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Device Address	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47

3.6 POWER LINE CARRIER INTERFACE MODULE (PLI) – OPTIONAL

The Raychem Power Line Carrier Interface Module (PLI) together with Raychem temperature transmitters provides remote temperature monitoring capability. The PLI module receives input from temperature transmitters over the power wires for the heat-tracing circuits, which carry the signals from special transmitters. The transmitters provide pipe temperatures from RTDs and continuity confirmation. Per PLI module, the NGC-30 system can accept up to 127 temperature inputs from SES's/SPCs or 255 temperature inputs from 700-TTs. Up to four PLIs can be connected to one NGC-30 UIT.

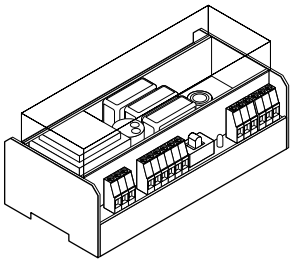
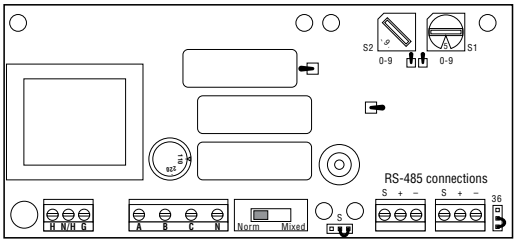


Fig. 3.9 PLI module

Set the RS-485 address for the PLI module using the rotary switches provided. Note the orientation of the clear plastic cover, then remove the cover. Use a slotted screwdriver to rotate the selector switches to the appropriate positions to select the RS-485 address. Each PLI module must have a unique address, if two PLI modules, CRM or RMM are assigned the same address, communication faults will result. The PLI module switch setting can be set from 1-99



Note: S1 switch is the one digit (0-9) and the S2 switch is the ten digit (0-9)

Fig. 3.10 PLI module rotary switch

SECTION 4 – APPENDICES

APPENDIX A – REPLACEMENT COMPONENT ORDERING GUIDE

Replacement Components

Description	Catalog Number	Part Number
User Interface Terminal - Nonhazardous (Unclassified) Locations/Indoors - Panel Mounting	NGC-UIT-ORD	10332-001
User Interface Terminal with NEMA 12 Enclosure - Nonhazardous (Unclassified) Locations/Indoors - Remote Mounting	NGC-UIT-ORD-12	10332-008
User Interface Terminal - Hazardous Locations/Outdoors - Panel Mounting	NGC-UIT-OUT	10332-003
UIT Adaptor Cable	NGC-UIT-232	10332-005
Card Rack Module (CRM) (for EMRs)	NGC-30-CRM	10720-001
Card Rack Module (CRMS) (for SSRs)	NGC-30-CRMS	10720-004
Current Transformer Module (CTM)	NGC-30-CTM	10720-002
Card Rack (CT)	NGC-30-CR	10720-003
Voltage Monitoring Module	NGC-30-CVM	10720-005
Remote Monitoring Module	RMM2	051778
Remote Monitoring Module(RMM2-4X) with NEMA 4X Enclosure	RMM2-4X	523420
Power Line Carrier Interface Module	PLI	488323

APPENDIX B – PANEL SPECIFICATIONS

Panel Specifications

Table B.1 Panel Specifications

General	
Area of use	NGC-30-EMR for nonhazardous locations NGC-30-EMR with Z purge for hazardous locations NGC-30-SSR for hazardous locations
Approvals	**Áreas no peligrosas** 9700701 ETL EN LISTA CUMPLE CON ANSI/UL STD. 508 UL STD. 508A CERTIFICADO A CAN/CSA C22.2 NO. 14 Intertek **Áreas peligrosas** (versión depurada de EMR) 9700701 ETL EN LISTA CUMPLE CON ANSI/UL STD. 508 UL STD. 508A CERTIFICADO A CAN/CSA C22.2 NO. 14 Intertek ETL EN LISTA CUMPLE CON NFPA STD 496 **Áreas peligrosas** (versión SSR) 9700701 ETL EN LISTA CUMPLE CON UL STD 508A ANSI/ISA STD 12.12.01 CERTIFICADO A CSA STD C22.2 NO. 213 CSA STD C22.2 NO. 14
Supply voltage	100 – 240 Vac, +5% / –10%, 50/60 Hz common supply for controller and heat-tracing circuit Up to 600 Vac for heat-tracing circuit when controller is powered from a separate circuit
Enclosure	
Protection/materials	NEMA 12 (indoors painted steel) NEMA 4/3R (outdoors, painted steel) NEMA 4X/3RX (outdoors, stainless steel)
Operating Temperature	Without distribution: –13°F to 140°F (–25°C to 60°C) Below –13°F (–25°C), space heater and thermostat must be used With distribution: 14°F to 140°F (–10°C to 60°C) Below 14°F (–10°C), space heater and thermostat must be used
Storage Temperature	–40°F to 167°F (–40°C to 75°C)
Relative humidity	0% to 90%, noncondensing
Control	
Control points	The Raychem NGC-30 system can control up to 260 circuits.
Relay types	3-pole, electromechanical (EMR versions) 1-, 2-, or 3-pole solid-state relays (SSR versions)
Voltage, maximum	240 Vac nominal, 50/60 Hz (standard), 600 Vac nominal (optional)
Current, maximum per circuit* * Depending on panelboard amperage rating, the maximum current may not be used on all circuits.	EMR: 30 A @ 104°F (40°C) or 60 A @ 104°F (40°C) SSR: 30 A @ 104°F (40°C) or 60 A @ 104°F (40°C)
Control algorithms	EMR: On/Off, Ambient on/off, PASC (proportional ambient sensing control) SSR: On/Off, Ambient on/off, PASC (proportional ambient sensing control), Proportional (includes soft start for all SSR control modes)
Control range	–99°F to 900°F (–73°C to 482°C)
Dead band	1°F to 50°F (1°C to 50°C) (On/Off control only)

Monitoring	
Temperature	
Low alarm range	–99°F to 900°F (–73°C to 482°C) or OFF
High alarm range	–99°F to 900°F (–73°C to 482°C) or OFF
Ground fault	
Alarm range	10 mA to 200 mA
Trip range	10 mA to 200 mA or OFF
Current	
Low alarm range	0 A to 100 A (where 0 equals OFF)
High alarm range	0 A to 100 A (where 0 equals OFF)
Voltage	100 – 277 Vac supply voltage to heat-tracing (**Note:** Requires the loss of one circuit)
Autocycle	Each loop can be programmed from 1 to 1000 hours or OFF
Temperature Sensor Inputs	
Temperature inputs per control point	Up to 4 inputs per circuit: One input standard per control point. Up to 3 additional RTDs can be assigned to each circuit.
Monitoring	Raychem NGC-30 system can monitor up to 1040 (260 x 4) temperatures
Temperature sources	Hard-wired, RMM2, PLI module
Quantities	Hard-wired: Up to 260 hard-wired temperature inputs, one per circuit RMM2 (optional): Up to 128 RTD inputs via RMM2 Modules. Up to 8 RTDs per RMM2 Module and up to 16 RMM2 Modules per NGC-30 controller PLI module (optional): Up to 127 RTDs via SES Transmitter (per PLI Module) Up to 127 RTDs via SPC Transmitter (per PLI Module) Up to 255 RTDs via 700-TT Transmitter (per PLI Module) Four PLI Modules per circuit, maximums 1040 RTDs
Types	100 Ω platinum RTD, 3-wire, a = 0.00385 ohms/ohm/°C Can be extended with a 3-conductor shielded cable of 20 W maximum per conductor (**Note:** power wire and RTD wire should not be housed in the same conduit).
Alarm Outputs	
Relay outputs	3 SPDT Form C. Rating: 3 A 100 – 277 Vac Each relay may be assigned to alarm outputs
Programming and Setting	
Method	Via NGC-UIT2 (User Interface Terminal)
Units	°F or °C
Digital display	5 ¾ inch x 3 ¼ inch LCD color touch screen (14.61 cm X 8.26 cm)
Memory	Nonvolatile, restored after power loss
Stored parameters (measured)	Minimum and maximum temperatures, contactor cycle count, heater time in use
Alarm conditions	Low/high temperature, low/high current, ground-fault alarm and trip, RTD failure, communications failure, relay failure, relay count, total time heater energized, contactor failure

Connection Terminals	
Heating cable output	Screw terminals, 20–6 AWG (30 A versions), 14–2 AWG (60 A versions)
Ground	14–4 AWG ground bar
RTD / alarm / communications	28–12 AWG spring clamp terminals
Distribution (for Raychem NGC-30 EMR only)	
Load power	120 / 208 / 240 / 277 / 347 / 480 / 600 Vac
Standard circuit breakers	**US (United States country code in ordering details):** Square D type QOB 120 / 208 / 240 Square D type NF 277 / 480 **CA (Canada country code in ordering details):** Cutler Hammer (Canada) type BAB 120 / 208 / 240 Cutler Hammer (Canada) type GBH 277 / 480 / 347 / 600
Circuit breaker amperage rating 120 Vac 208, 240, 277, 347, 480, 600 Vac	 20 A, 30 A, 40 A, 50 A 20 A, 30 A, 40 A, 50 A, 60 A, 70 A

APPENDIX C – NGC-30-CRM/-CRMS SPECIFICATIONS

Table C.1 NGC-30-CRM/-CRMS Specifications

General	
Approvals/certifications	Clase I, Div. 2, Grupos A,B,C,D Ex nC IIC T5 Clase I, Zona 2, AEx nC IIC T5
Supply voltage	12 Vdc ± 10%
Internal power consumption	< 5 W per NGC-30-CRM/-CRMS
Operating temperature	–40°F to 140°F (–40°C to 60°C)
Storage temperature	–40°F to 167°F (–40°C to 75°C)
Environment	PD2, CAT III
Max. altitude	2000 m
Humidity	0–90% noncondensing
Electromagnetic Compatibility	
Immunity	Heavy industrial
Emission	Residential, commercial, light industrial
Temperature Sensors	
Type	100 W platinum RTD, 3 wire, a = 0.00385 ohms/ohm/°C Can be extended with a 3-conductor shielded cable of 20 ohm maximum per conductor
Quantity	Up to five wired directly to each NGC-30-CRM/-CRMS
Current Sensors	
Mounting	DIN Rail – 35 mm
Quantity per NGC-30-CTM	Five for ground-current measurement. Five for line-current measurement
Line Current Sensors	
Max. current	60 A
Accuracy	± 2% of reading
Ground-Fault Sensor	
Range	10–200 mA
Accuracy	± 4% of range at 30 A line current
Voltage Sensor	
Range	80–290 Vac 50/60 Hz
Accuracy	± 1% of span
Outputs	
CRM output relays	Form A 3-Amp @ 277 Vac max 50/60 Hz
CRMS SSR outputs	12 Vdc @ 30 mA max per output
Alarm relay	Form C 3-Amp @ 277 Vac max 50/60 Hz
Communication to NGC-UIT2 or 200N	
Type	2-wire RS-485
Cable	One shielded twisted pair
Length	4000 ft. (1200 m) maximum* ***Note:** May require an RS-485 repeater if communication length is greater than 4000 ft.
Quality	Up to 52* NGC-30-CRM/-CRMS may be connected to one NGC-UIT2 Up to 16 NGC-30-CRM/-CRMS may be connected to one 200N
Connection Terminals	
Power supply/pilot relay/RTD/ comm port (RS485)	18–12 AWG (0.8 - 3.3mm2)

APPENDIX D – NGC-UIT2 SPECIFICATIONS

General	
Approvals	NGC-UIT2-ORD **Áreas no peligrosas** C US LR67275 CE
	NGC-UIT2-ORD-R **Áreas no peligrosas** C US CE
Supply voltage	100 – 240 Vac ±10%, 25 A max/25 VA, 50/60 Hz
Operating temperature	–40°F to 149°F (–40°C to 65°C)
EMC	Immunity – industrial Emission – commercial / light industrial
Vibration	Unit tested to IEC-60068-2-6
Shock	Unit tested to IEC-60068-2-27
Dimensions	10-1/4" wide X 6-5/8" high X 3" deep (260 mm wide X 168 mm high X 76 mm deep)
Control Outputs	
Relay outputs	Three relay outputs, Form C contacts, switching loads up to 277 Vac / 3 A
	Relays may be assigned for alarm outputs
	11 position Phoenix-style pluggable screw terminal connector with retaining screws
Network Connection	
Local/Remote Port	RS-485/RS-232, selectable. Port may be used to communicate with Raychem Supervisor software
	RS-232 is non-isolated, RJ-11 connection
	RS-485, 2-wire isolated. Phoenix-style pluggable screw terminal connector with retaining screws. Maximum number of devices 256. Fail safe design with optional termination resistors.
	Data Rate 9600 to 57600 baud
	Maximum cable length for RS-485 not to exceed 4000 feet (1200 m). Cable to be shielded twisted pair
Field Port	RS-485, 2-wire isolated. Used to communicate with external devices, such as NGC-30-CRM, NGC-30-CRMS, and RMM2. Maximum cable length not to exceed 4000 ft (1200 m). Cable to be shielded twisted pair
	Phoenix-style pluggable screw terminal connector with retaining screws. Maximum number of devices 256. Fail safe design with optional termination resistors
	Data rate to 9600 baud
LAN	10/100 Base-T Ethernet port with Link and Activity Status LEDs
USB Ports	USB 2.0 Host port Type A receptacle
Status LEDs	
Relay	Three LEDs showing the ON/OFF Status for each relay, LED ON indicates relay is energized
Field	Transmit and Receive activity
Local/remote	Transmit and Receive activity

USB host	Three colors showing status:	Red	=	USB key fault
		Green	=	USB key inserted
		Yellow	=	USB in use
UIT status	Three colors showing system status:	Green	=	Normal condition
		Red	=	Fault condition
		Yellow	=	Loading software/configuration
LCD Display				
Display	LCD is a 6.5 inch QVGA, color TFT transflective device with integral CCFL backlight. (For use indoors or when protected from direct sunlight)			
Touch screen	4-wire resistive touch-screen interface for user entry. Usable with gloved fingers			

APPENDIX E – DEVICE ADDRESS

Table E.1 Device Address

Device	Device Type	Switch Setting	Device Address
NGC-30-CRM/-CRMS	Relay Output/RTD	1–99	1–99 (If RMM2s are equipped or will be added in the future, skip addresses 32–47)
RMM2	RTD	0	32
RMM2	RTD	1	33
RMM2	RTD	2	34
RMM2	RTD	3	35
RMM2	RTD	4	36
RMM2	RTD	5	37
RMM2	RTD	6	38
RMM2	RTD	7	39
RMM2	RTD	8	40
RMM2	RTD	9	41
RMM2	RTD	A	42
RMM2	RTD	B	43
RMM2	RTD	C	44
RMM2	RTD	D	45
RMM2	RTD	E	46
RMM2	RTD	F	47
PLI module	RTD	1-99	1-99

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